

VOLUME 9 OF 13

STUDY TITLE

Summary of Tier I Nontarget Organism Data Requirements and Waiver Requests for
Salicylic Acid Technical

DATA REQUIREMENTS

40 CFR 158.2060
Ecological Effects (Nontarget Organisms)

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STATEMENT OF DATA CONFIDENTIALITY CLAIMS

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA Section 10(d)(1)(A), (B), or (C).

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The material presented in this report is descriptive in nature and, as such, is not subject to the Good Laboratory Practice regulations as set forth in 40 CFR 160.

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QUALITY ASSURANCE STATEMENT

The material presented in this report is descriptive in nature and, as such, is not subject to being audited by a Quality Assurance Unit.

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INTRODUCTION

This document presents a summary of the information available on the effects to nontarget organisms of Salicylic Acid Technical, a new active ingredient in the end use products LPI 6194 Concentrate and LPI 6194 RTU. This document also presents information as to why no additional nontarget organism data is required to support the registration of Salicylic Acid Technical or for the two end use products.

Salicylic Acid Technical contains 98.7% salicylic acid. LPI 6194 Concentrate and LPI 6194 RTU contain three active ingredients:

- ... Salicylic Acid Technical (Chemical Code 76606, CAS Number 69-72-7)
- ... Chitosan (Chemical Code 128930, CAS Number 9012-76-4), and
- ... Indole-3-butyric Acid (Chemical Code 46701, CAS Number 133-32-4).

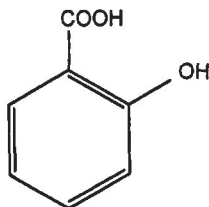
The concentrations of these active ingredients in the formulations are:

Active Ingredient	LPI 6194 Concentrate	LPI 6194 RTU
Salicylic Acid	0.04	0.0067
Chitosan	1.0	0.17
IBA	0.02	0.0033

Information for Salicylic Acid is discussed in this document. Information for Chitosan and Indole-3-butyric acid are presented in a separate document.

SALICYLIC ACID

Salicylic acid is also called 2-hydroxybenzoic acid. The molecular formula for salicylic acid is $C_7H_6O_3$ and it has a molecular weight of 138.12. Its structure is shown below:



Salicylic Acid is derived from the Latin word for the willow tree, *Salix*, from whose bark Salicylic Acid is obtained. This material is widely used in organic synthesis. In nature, it functions as a plant hormone.

Salicylic acid is found in plants and plays a role in plant growth and development, photosynthesis, transpiration, ion uptake and transport. Salicylic Acid also induces specific changes in leaf anatomy and chloroplast structure. Salicylic Acid is involved in endogenous signaling, mediating in plant defense against pathogens (Hayat and Ahmad). Salicylic Acid defends plants against pathogens by inducing the production of pathogenesis-related proteins (Van Huijsduijnen). When one part of a plant is attacked by a pathogen, Salicylic Acid plays a role in systemic acquired resistance (SAR) so that other parts of the plant become resistant to attack by the pathogen. Salicylic Acid is converted in plants to methyl salicylate, which is volatile and can move to nearby plants and impart the same type of signals in those plants (Engleberth, Taiz and Zeiger). A more complete description of the mode-of-action of Salicylic Acid is presented in Volume 13 of this submission.¹

Salicylic acid is a precursor in the manufacture of aspirin (acetylsalicylic acid) and is allowed in concentrations of up to 8% in aspirin effervescent tablets for oral solutions (lesser concentrations in other forms of aspirin). Aspirin, also known as acetylsalicylic acid is a common salicylate drug used to relieve minor aches and pains, reduce fever and as an anti-inflammatory medication. Acetylsalicylic acid is rapidly hydrolyzed after absorption from the gut resulting in salicylic acid (Fiume).

Salicylic Acid is used in a wide range of cosmetic products at concentrations up to 3%. Furthermore, salicylic acid is an approved active ingredient for use in topical acne drug products, in wart, corn and callous remover drug products, and drugs for the control of dandruff, seborrheic dermatitis and psoriasis (see 21 CFR 358.510, 358.710, 358.150 and 358.550). Salicylic Acid and derivatives of salicylic acid are also used as an indirect food additive (see 21 CFR 175.105, 177.1010 and 178.2010). There are countless other uses of salicylic acid (Fiume).

The two Loveland Products Inc.'s end use products LPI 6194 Concentrate and LPI 6194 RTU contain salicylic acid. The concentration of Salicylic Acid in LPI 6194 Concentrate is 0.04% and in LPI 6194 RTU is 0.0067%. These products will be used to treat commercial seeds at very low application rates. LPI 6194 RTU is applied at a concentration of 2 to 6 fl.oz per hundred lbs. of seeds. LPI 6194 Concentrate is diluted with water and applied to seeds at the same rate as LPI 6194 RTU. An estimate of the Salicylic Acid application rates and amount of residues on seeds based on the label directions was determined using EPA's TREX model (see Appendix 1 for printouts of input parameters, application rates, and maximum seed residues). The application rates in lb AI/A depend on the type of seed being treated but the Salicylic Acid rates varied from 2.1×10^{-6} to 5.99×10^{-5} lb AI/A.

¹ Tillman, A. M. Salicylic Acid Mode of Action.

Salicylic Acid Technical and LPI 6194 Concentrate have been tested in both mammalian and nontarget organism studies. The mammalian toxicity data are summarized in Tables 1 and 2 and the nontarget organism data are summarized in Table 3.

Based on the complete battery of acute toxicity studies conducted with Salicylic Acid Technical, it can be concluded that Salicylic Acid has low acute mammalian oral and dermal toxicity, is a moderate eye irritant, is not a skin irritant and is not a dermal sensitizer. Salicylic Acid is considered moderately to practically non-toxic to avian species and practically non-toxic to aquatic organisms. It is practically non-toxic to the honey bee via contact exposure.

LPI 6194 Concentrate is of very low acute mammalian toxicity via the oral, dermal, and inhalation routes of exposure. It is not irritating to skin or eyes and is not a dermal sensitizer. LPI 6194 Concentrate is categorized at Toxicity Category IV for all routes of exposure.

LPI 6194 Concentrate was tested to determine effects on emergence, survival, height and dry weight of ten species of plants in a 21-Day seedling emergence test. The results are presented in Table 4. At a pre-emergence application rate of 9 fluid ounces of a 1:5 dilution of LI 6194 Concentrate per acre, no reduction of 25% or greater, relative to the control, was observed for any endpoint of eight terrestrial plant species tested at 21 days following application. Reductions of 25% or more were observed on oilseed rape (emergence) and lettuce (dry weight) and additional studies will be carried out to determine the extent of these effects.

A vegetative vigor study on 10 species of plants was conducted with LPI 6194 Concentrate to determine effects on plant survival, condition and growth (weekly height measurements and dry weight measurements of plant shoots at test termination). A foliar application at the rate of 9 fluid ounces of a 1:5 dilution of LPI 6194 Concentrate per acre resulted in no reduction of 25% or greater, relative to the control, for any endpoint of nine terrestrial plant species tested at 21 days following application. A reduction of 25% was observed in *Lolium perenne* (dry weight), a result which is just on the borderline of being considered an effect. Signs of phytotoxicity were infrequently observed, predominantly slight in severity, and present on plants of both the control and the treatment group. Therefore, the signs did not appear to be treatment-related. A summary of the results are presented in Table 5.

The data generated with Salicylic Acid Technical and LPI 6194 Concentrate are sufficient to characterize salicylic acid's low toxicity to nontarget organisms. No additional nontarget organism testing should be required for Salicylic Acid for several reasons:

- ***Data from mammalian acute toxicity studies and Tier I nontarget organism studies have been conducted with Salicylic Acid Technical or its end use product LPI 6194 Concentrate.*** Both Salicylic Acid and LPI 6194 Concentrate are practically non-toxic to mammals. Salicylic Acid is not toxic to insects and LPI 6194 Concentrate, for the most part, has not effect on seed germination or vegetative vigor in nontarget plant species. Although not tested, LPI 6194 RTU is an aqueous dilution of LPI 6194 Concentrate and will have similar low toxicity to mammals or to nontarget organisms.
- ***There are no public literature data that demonstrates that there are toxic effects to nontarget plants and insects that are exposed to naturally-occurring levels of Salicylic Acid.*** Salicylic Acid is common throughout the plant kingdom and is known as a regulator for physiological processes such as thermogenesis or plant defense against harmful microorganisms (Raskin; Metraux; Jones; Silverman). The majority of the work on the function of Salicylic Acid has been performed with *Arabidopsis* (*Brassica* family). So far, all scientific papers support the importance of Salicylic Acid in the regulation of plant growth, development, and abiotic and

biotic responses in all plant species described, even in very sensitive species, at a moderate concentration (no more than 100-200 mg/L).

- ***Salicylic Acid is found naturally in crops, plants and insects.*** Salicylic Acid is a naturally occurring substance whose level in plants and insects has been documented (Scotter). Nontarget plants biosynthesize Salicylic Acid as do other plants in response to stress due to fluctuating temperatures, attack by insects and fungal diseases. Salicylic Acid does not cause adverse effects to plants at those levels. Levels of up to 0.3 ppm Salicylic Acid have been reported to be present in a wide variety of plants (and insects): Salicylic Acid has been detected in a total of 76 foodstuffs comprising fruit (16), fresh and prepared vegetables (13), herbs and spices (12), flavorings and sauces (9), beverages (20) and miscellaneous foods (6). By using gas chromatography-mass spectrometry, Salicylic Acid residue levels were found to be 0.3 mg/kg or greater in 32 fruit and vegetables including apples, bananas, lemons, nectarines, plums, grapes, tomatoes, carrots, cucumber, peas, and a variety of herbs and spices, flavorings and sauces, and beverages (Scotter).
- ***Levels of Salicylic Acid in the environment will not significantly increase above background levels when LPI 6194 Concentrate or LPI 6194 RTU are used according to the proposed label use directions.*** These formulations are to be used as commercial seed treatments and will not result in increased exposure to the environment to residues of Salicylic Acid. Salicylic Acid residues on treated seeds are expected to remain on the seed, to be diluted by plant growth, or to be metabolized by the growing plant. The application rates on seeds are very low (less than 0.00006 mg AI/Acre).
- ***Salicylic Acid is metabolized in plants to methyl salicylate and to the conjugates salicylic acid glucose ester and 8-O-D-glucosalicylic acid (Lee). Salicylic Acid is metabolized in animals to more highly polar metabolites including glucuronides (McMahon).*** Salicylic Acid is also thought to degrade to benzaldehyde, benzyl alcohol, hydroxysalicylic acid, 1,2-benzoquinone, and then to smaller molecules such as maleic acid, fumaric acid and oxalic acid, and ultimately, to carbon dioxide. Salicylic acid is rapidly metabolized in mammals and polar metabolites are excreted typically within 48 hours of dosing.
- ***Salicylic Acid will be applied at very low use rates and will not contaminate ground or surface water.*** It is unlikely that Salicylic Acid will be detected in ground or surface water either due to naturally occurring Salicylic Acid or from the very low use rates of Salicylic Acid as a plant growth regulator when applied to seeds. The concentration of Salicylic Acid in LPI 6194 Concentrate is 0.04% and in LPI 6194 RTU is 0.0067%. These products are applied to seeds at very low application rates: LPI 6194 RTU is applied at a concentration of 2 to 6 fl. oz per hundred lbs. of seeds (9 fl. oz. per acre) and LPI 6194 Concentrate is diluted with water to the same rate as LPI 6194 RTU. Based on the proposed use rates of Salicylic Acid as a seed treatment, Salicylic Acid residues in treated seeds are not expected to exceed 0.27 mg Salicylic acid per 1,000 g of seed (see TREX output in Appendix 1). Commercially, the seeds are planted and covered with soil so residues are unlikely to wash off and possibly reach water from runoff. Residues on the seeds are very low (0.26 mg Salicylic Acid per 1,000 g seeds) and are unlikely to contaminate groundwater.
- ***Salicylic Acid readily degrades in water under aerobic and anaerobic conditions and in the presence of sunlight.*** Photochemical degradation in the air is expected to occur by reaction of Salicylic Acid with photochemically-produced hydroxyl radicals. The aquatic degradation of Salicylic Acid results in formation of smaller acids which eventually become incorporated into humic acids. Natural Salicylic Acid residues in plants that die and fall into lakes, streams or ponds will degrade and become incorporated into humic acids in sediments.

- *Residues on treated seeds are very low. Based on available data, Risk Quotients will not be exceeded for birds.* It is assumed that most of the treated seeds are incorporated into the soil at planting. If 1% of treated seeds remain unincorporated and are available for consumption by birds, exposures to birds would be very low. TREX estimated residues on seeds to be 0.26 mg Salicylic Acid per 1,000 g seeds. Assuming most seeds are planted at 150 lb seed per acre (68,100 g per acre), only 681 seeds would be available for consumption. If a single bird weighing 178 kg consumed all 681 treated seeds in one day, this would amount to consumption of 0.17 mg Salicylic Acid, a dose of 0.0096 mg/kg which is far below the LC₅₀ for bobwhite quail (494 mg AI/kg).
- Because of its natural occurrence in plants, Loveland Products Inc. believes that Salicylic Acid will not be toxic to threatened or endangered species because Salicylic Acid is not expected to be toxic to other nontarget plant or insect species.

The data generated with Salicylic Acid Technical and LPI 6194 Concentrate are sufficient to characterize salicylic acid's low toxicity to nontarget organisms, including plants, birds and insects. No additional nontarget organism testing should be required for Salicylic Acid.

Table 1. Acute Mammalian Toxicity Profile for Salicylic Acid Technical

Study Type/OPPTS Guideline	LD ₅₀ Results	Toxicity Category	MRID
Acute Oral Toxicity/OPPTS 870.1100	890 mg/kg	III	47206707
Acute Dermal Toxicity/OPPTS 870.1200	> 5050 mg/kg	IV	47206711
Acute Inhalation Toxicity/OPPTS 870.1300	> 2.21 mg/L	IV	47206710
Acute Eye Irritation/OPPTS 870.2400	Based on the irritation score of 15.3, the test material is rated moderately irritating. All of the findings cleared by 72 hours.	III	47206706
Primary Skin Irritation/OPPTS 870.2500	No erythema or edema observed. Non-irritating	IV	47206709
Skin Sensitization/OPPTS 870.2600	Negative	--	47206708

Table 2. Acute Mammalian Toxicity Profile for LPI 6194 Concentrate

Study Type/OPPTS Guideline	LD ₅₀ Results	Toxicity Category	MRID
Acute Oral Toxicity/OPPTS 870.1100	>5000 mg/kg	IV	47036603
Acute Dermal Toxicity/OPPTS 870.1200	5050 mg/kg	IV	47036605
Acute Inhalation Toxicity/OPPTS 870.1300	> 2.23 mg/L	IV	47036606
Acute Eye Irritation/OPPTS 870.2400	No positive effects exhibited in any eyes at any time during the study.	IV	47036601
Primary Skin Irritation/OPPTS 870.2500	PII = 0.1; Slightly irritating based on scores at 72-hour observation only.	IV	47036602
Skin Sensitization/OPPTS 870.2600	Negative	--	47036604

Table 3. Tier I Nontarget Organism Toxicity Profile for Salicylic Acid Technical

Study Type/OPPTS Guideline	LD ₅₀ /LC ₅₀ Results	Results	MRID
850.2100 - Acute Avian Oral Toxicity: Bobwhite Quail	LD ₅₀ = 494 mg AI/kg (95% confidence interval 396-614 mg AI/kg)	Moderately toxic	47206704
850.2200 - Acute Avian Dietary Toxicity: Mallard Duck	LC ₅₀ > 5,000 ppm AI NOAEL = 2500 ppm AI	Practically non-toxic	47206702
850.2200 - Acute Avian Dietary Toxicity: Bobwhite Quail	LC ₅₀ > 5,000 ppm AI NOAEL = 2500 ppm AI	Practically non-toxic	47229501
850.1075 - Fish Toxicity: Trout	96-hr LC ₅₀ = 134.8 mg AI/L (95% confidence interval 125-145 mg AI/L) NOEC = 85.3 mg/L	Practically non-toxic	47206705
850.1010 Freshwater Invertebrate Toxicity: <i>Daphnia</i>	48-hr EC ₅₀ = 184.88 mg AI/L (95% confidence interval 182.1-187.7 mg AI/L) NOEC = 150.3 mg/L	Practically non-toxic	47206703
850.3020 Honey Bee Acute Contact	96-hr Contact LD ₅₀ > 100 ug/bee	Practically non-toxic	Volume 12 of this submission ²

² Porch, J. R. and Krueger, H. O. Salicylic Acid Technical: An Acute Contact Toxicity Study with the Honey Bee.

Table 4. Tier I Nontarget Plant Toxicity Profile for LPI 6194 Concentrate³

Effects of LI 6194 Concentrate on Emergence, Survival, Height and Dry Weight of Ten Species of Plants in a 21-Day Seedling Emergence Test

Species: Treatment Group (fl oz/Ac)	% Emergence Mean \pm SD (% Reduction)	% Survival Mean \pm SD (% Reduction)	Dry Weight (g) Mean \pm SD (% Reduction)	Height (cm) Mean \pm SD (% Reduction)
<i>Allium cepa</i> (Onion):				
Negative Control	6.00 \pm 0.00	91.7 \pm 9.62	0.017 \pm 0.0040	20.1 \pm 1.89
9	5.75 \pm 0.96 (4%)	82.9 \pm 20.34 (10%)	0.025 \pm 0.0029 (-53%)	22.0 \pm 1.27 (-9%)
<i>Lolium perenne</i> (Ryegrass):				
Negative Control	9.25 \pm 0.96	100.0 \pm 0.00	0.009 \pm 0.0022	15.5 \pm 1.93
9	7.00 \pm 1.41* (24%)	100.0 \pm 0.00 (0%)	0.015 \pm 0.0068 (-62%)	15.1 \pm 1.11 (3%)
<i>Triticum aestivum</i> (Wheat):				
Negative Control	9.75 \pm 0.50	100.0 \pm 0.00	0.310 \pm 0.0253	47.8 \pm 2.45
9	9.50 \pm 0.58 (3%)	100.0 \pm 0.00 (0%)	0.331 \pm 0.0348 (-7%)	46.1 \pm 3.11 (4%)
<i>Zea mays</i> (Corn):				
Negative Control	8.00 \pm 1.83	97.5 \pm 5.00	2.11 \pm 0.355	86.6 \pm 7.43
9	8.00 \pm 0.82 (0%)	96.9 \pm 6.25 (1%)	2.02 \pm 0.206 (4%)	86.0 \pm 3.53 (1%)
<i>Brassica napus</i> (Oilseed Rape):				
Negative Control	8.00 \pm 1.41	91.3 \pm 10.78	0.611 \pm 0.0709	24.0 \pm 2.40
9	4.50 \pm 1.00* (44%)	100.0 \pm 0.00 (-10%)	0.838 \pm 0.0669 (-37%)	26.5 \pm 2.65 (-10%)

Mean \pm SD = Mean plus or minus one standard deviation.

* - Treatment group mean was significantly different from the control mean ($p < 0.05$).

³ Porch, J. R. and Krueger, H. O. LPI 6194 Concentrate: A Toxicity Test to Determine the Effects of the Test Substance on Seeding Emergence of Ten Species of Plants.

Table 4 (continued) Tier I Nontarget Plant Toxicity Profile for LPI 6194 Concentrate
Effects of LI 6194 Concentrate on Emergence, Survival, Height and Dry Weight of Ten Species of Plants in a 21-Day Seedling Emergence Test

Species: Treatment Group (fl oz/Ac)	% Emergence Mean \pm SD (% Reduction)	% Survival Mean \pm SD (% Reduction)	Dry Weight (g) Mean \pm SD (% Reduction)	Height (cm) Mean \pm SD (% Reduction)
<i>Brassica oleracea</i> (Cabbage):				
Negative Control	8.00 \pm 1.63	88.1 \pm 17.72	0.343 \pm 0.0859	18.0 \pm 3.73
9	7.25 \pm 0.50 (9%)	96.4 \pm 7.14 (-9%)	0.319 \pm 0.1072 (7%)	18.8 \pm 1.80 (-5%)
<i>Glycine max</i> (Soybean):				
Negative Control	8.50 \pm 1.29	87.0 \pm 11.77	1.21 \pm 0.350	33.5 \pm 4.46
9	8.75 \pm 1.26 (-3%)	95.0 \pm 10.00 (-9%)	1.07 \pm 0.056 (11%)	32.2 \pm 2.44 (4%)
<i>Lactuca sativa</i> (Lettuce):				
Negative Control	4.75 \pm 2.63	88.1 \pm 15.79	0.255 \pm 0.2553	14.0 \pm 4.93
9	5.75 \pm 1.50 (-21%)	74.5 \pm 12.35 (15%)	0.151 \pm 0.1048 (41%)	14.7 \pm 2.87 (-5%)
<i>Lycopersicon esculentum</i> (Tomato):				
Negative Control	9.00 \pm 1.15	86.9 \pm 12.48	0.340 \pm 0.0274	25.4 \pm 3.46
9	9.00 \pm 0.82 (0%)	89.1 \pm 8.25 (-3%)	0.342 \pm 0.0986 (-1%)	27.4 \pm 2.88 (-8%)
<i>Phaseolus vulgaris</i> (Bean):				
Negative Control	9.25 \pm 0.96	100.0 \pm 0.00	1.03 \pm 0.079	25.0 \pm 1.38
9	8.75 \pm 1.26 (5%)	96.4 \pm 7.14 (4%)	1.17 \pm 0.213 (-14%)	26.5 \pm 2.46 (-6%)

Mean \pm SD = Mean plus or minus one standard deviation.

* - Treatment group mean was significantly different from the control mean ($p < 0.05$).

Table 5. Tier I Nontarget Plant Toxicity Profile for LPI 6194 Concentrate⁴
Effects of LPI 6194 Concentrate on Height and Dry Weight of Ten Species of Plants
in a 21-Day Vegetative Vigor Test

Species: Treatment Group (fl oz/Ac)	Height (cm) Mean \pm SD (% Reduction)			Dry Weight (g) Mean \pm SD (% Reduction)
	Day 7	Day 14	Day 21	Day 21
<i>Allium cepa</i> (Onion):				
Negative Control	21.4 \pm 1.21	21.4 \pm 2.62	21.0 \pm 2.99	0.0414 \pm 0.01264
9	21.6 \pm 0.97 (-1%)	23.1 \pm 2.73 (-8%)	22.5 \pm 2.95 (-7%)	0.0577 \pm 0.03723 (-39%)
<i>Lolium perenne</i> (Ryegrass):				
Negative Control	20.2 \pm 0.61	22.0 \pm 1.50	25.2 \pm 2.05	0.728 \pm 0.1728
9	18.8 \pm 2.08 (7%)	21.3 \pm 2.09 (3%)	24.4 \pm 2.11 (3%)	0.544 \pm 0.1366* (25%)
<i>Triticum aestivum</i> (Wheat):				
Negative Control	37.5 \pm 1.53	41.7 \pm 1.48	48.0 \pm 2.11	0.860 \pm 0.0975
9	35.8 \pm 1.21* (5%)	40.5 \pm 1.78 (3%)	47.5 \pm 1.47 (1%)	0.847 \pm 0.1097 (1%)
<i>Zea mays</i> (Corn):				
Negative Control	59.6 \pm 7.54	89.5 \pm 10.23	118.6 \pm 12.27	4.69 \pm 0.805
9	63.0 \pm 5.65 (-6%)	94.0 \pm 8.04 (-5%)	123.2 \pm 13.56 (-4%)	5.25 \pm 0.548 (-12%)
<i>Brassica napus</i> (Oilseed Rape):				
Negative Control	28.3 \pm 2.53	37.0 \pm 3.62	45.8 \pm 5.32	4.76 \pm 0.946
9	27.2 \pm 1.05 (4%)	34.3 \pm 1.60 (7%)	41.9 \pm 2.41 (9%)	4.78 \pm 0.831 (0%)

Mean \pm SD = Mean plus or minus one standard deviation.

* Treatment group mean was determined to be significantly different ($p < 0.05$) from the control mean.

⁴ Porch, J. R. and Krueger, H. O. LPI 6194 Concentrate: A Toxicity Test to Determine the Effects of the Test Substance on Vegetative Vigor of Ten Species of Plants.

Table 5 (continued). Tier I Nontarget Plant Toxicity Profile for LPI 6194 Concentrate
Effects of LPI 6194 Concentrate on Height and Dry Weight of Ten Species of Plants
in a 21-Day Vegetative Vigor Test

Species: Treatment Group (fl oz/Ac)	Height (cm) Mean \pm SD (% Reduction)			Dry Weight (g) Mean \pm SD (% Reduction)
	Day 7	Day 14	Day 21	Day 21
<i>Brassica oleracea</i> (Cabbage):				
Negative Control	17.4 \pm 1.40	18.9 \pm 1.06	19.2 \pm 1.04	3.52 \pm 0.219
9	18.8 \pm 1.08 (-8%)	20.3 \pm 1.80 (-8%)	20.8 \pm 2.39 (-9%)	3.76 \pm 0.505 (-7%)
<i>Glycine max</i> (Soybean):				
Negative Control	39.7 \pm 2.03	64.0 \pm 7.40	105.8 \pm 19.3	7.53 \pm 1.71
9	37.9 \pm 2.36 (4%)	62.1 \pm 4.83 (3%)	102.7 \pm 9.24 (3%)	7.07 \pm 0.563 (6%)
<i>Lactuca sativa</i> (Lettuce):				
Negative Control	15.6 \pm 1.78	18.6 \pm 1.92	20.8 \pm 2.84	3.53 \pm 0.558
9	14.5 \pm 2.49 (7%)	17.9 \pm 2.06 (4%)	19.9 \pm 2.50 (4%)	3.29 \pm 0.517 (7%)
<i>Lycopersicon esculentum</i> (Tomato):				
Negative Control	29.6 \pm 2.78	43.7 \pm 3.72	58.0 \pm 3.22	4.84 \pm 0.806
9	32.9 \pm 0.52 (-11%)	49.6 \pm 2.28 (-14%)	63.9 \pm 3.61 (-10%)	6.88 \pm 0.568 (-42%)
<i>Phaseolus vulgaris</i> (Bean):				
Negative Control	34.2 \pm 5.00	77.1 \pm 7.84	85.8 \pm 7.37	5.56 \pm 0.716
9	36.3 \pm 3.98 (-6%)	75.9 \pm 10.8 (2%)	83.5 \pm 7.87 (3%)	5.77 \pm 0.774 (-4%)

Mean \pm SD = Mean plus or minus one standard deviation..

No treatment group mean was determined to be significantly different ($p > 0.05$) from the control mean.

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Appendix 1. TREX Printout for Salicylic Acid

TREX MODEL INPUTS		
These values will be used in the calculation of exposure estimates for foliar, granular, liquid and/or seed applications of pesticides.		
Chemical Identity and Application Information		
Chemical Name:	Salicylic Acid	
Use:	seed treatment	
Product name and form:	LPI 6194 RTU liquid	
% A.I. (leading zero must be entered for formulations <1% a.i.):	0.00670%	
Application Rate (lbs/A):	0.0000599	
Half-life (days):	35	
Application Interval (days):		
Number of Applications:	1	
Assessed Species Inputs (optional, use defaults for RQs for national level assessments)		
What body weight range is assessed (grams)?	Birds	Mammals
Small	20	15
Medium	100	35
Large	1000	1000
Note: Sources of wildlife diet are assumed to be available for less than one year for this model.		

Avian			
Endpoint	Toxicity value	Indicate test species below	
LD50 (mg/kg-bw)	494 Bobwhite Quail	1	
LC50 (mg/kg-diet)	5000.00 Mallard Duck	2	
NOAEL (mg/kg-bw)		2	
NOAEC (mg/kg-diet)		1	
Enter the Mineau et al. Scaling Factor		1.15	
Mammalian		Acute Study	Chronic Study
Size (g) of mammal used in toxicity study Default rat body weight is 350 grams		350	350
Endpoint	Toxicity value		Reference (MRID)
LD50 (mg/kg-bw)	5000		
LC50 (mg/kg-diet)			
Reported Chronic Endpoint	25.00	mg/kg-bw	
Is dietary concentration (mg/kg-diet) reported from the available chronic mammal study? (yes or no)	no		
Enter dietary concentration (mg/kg-diet)			
Estimated Chronic Diet Concentration Equivalent to Reported Chronic Daily Dose	500	mg/kg-diet based on standard FDA lab rat conversion	

	Chemical:	Salicylic Acid						
	Name of seed treatment formulation:	LPI 6194 RTU						
	Percent AI in formulation:	0.00670%		0	Density of product (lbs/gal):			8.47
Endpoints		Reported	Tested Body	Adjusted LD50				
			Weight (g)					
	Avian LD50:	494.00	178	355.89				
	Avian repro. NOAEC:	0.00						
	Mammalian LD50:	5000.00	190	9432.69				
	Mammalian NOAEC:	500.00						

Crop	Maximum Seeding Rate (lbs/acre)	Application Rate (fl oz/cwt)	Application Rate (lbs. Ai/cwt)
Barley	100	6	0.0000266
beans	160	6	0.0000266
dried beans	160	6	0.0000266
lima beans (succulent)	100	6	0.0000266
snap beans	100	6	0.0000266
Canola	8	6	0.0000266
Corn	25	6	0.0000266
Cotton	18	6	0.0000266
Oats	128	6	0.0000266
Onion	15	6	0.0000266
cowpeas/ blackeyed peas	50	6	0.0000266
Pea	180	6	0.0000266
lupine	170	6	0.0000266
grain lupine	170	6	0.0000266
field peas	225	6	0.0000266
Peanuts	135	6	0.0000266
Rice	160	6	0.0000266
Rye	150	6	0.0000266
Safflower	100	6	0.0000266
Sorghum	8	6	0.0000266
Soybeans	100	6	0.0000266
soybeans, edible	100	6	0.0000266
Sugar beets	8	6	0.0000266
Triticale	90	6	0.0000266
Wheat	135	6	0.0000266

Crop	Maximum Application Rate	Maximum Seed Application Rate	Avian Nagy Dose	Mammalian Nagy Dose	Available AI
	(lbs ai/A)	(mg ai/kg seed)	(mg ai/kg-bw/day)	(mg ai/kg-bw/day)	(mg ai ft-2)
Barley	0.0000266	0.2660109	0.0673244	0.0563602	0.0002776
beans	0.0000426	0.2660109	0.0673244	0.0563602	0.0004441
dried beans	0.0000426	0.2660109	0.0673244	0.0563602	0.0004441
lima beans (succulent)	0.0000266	0.2660109	0.0673244	0.0563602	0.0002776
snap beans	0.0000266	0.2660109	0.0673244	0.0563602	0.0002776
Canola	0.0000021	0.2660109	0.0673244	0.0563602	0.0000222
Corn	0.0000067	0.2660109	0.0673244	0.0563602	0.0000694
Cotton	0.0000048	0.2660109	0.0673244	0.0563602	0.0000500
Oats	0.0000340	0.2660109	0.0673244	0.0563602	0.0003553
Onion	0.0000040	0.2660109	0.0673244	0.0563602	0.0000416
cowpeas/ blackeyed peas	0.0000133	0.2660109	0.0673244	0.0563602	0.0001388
Pea	0.0000479	0.2660109	0.0673244	0.0563602	0.0004996
lupine	0.0000452	0.2660109	0.0673244	0.0563602	0.0004719
grain lupine	0.0000452	0.2660109	0.0673244	0.0563602	0.0004719
field peas	0.0000599	0.2660109	0.0673244	0.0563602	0.0006246
Peanuts	0.0000359	0.2660109	0.0673244	0.0563602	0.0003747
Rice	0.0000426	0.2660109	0.0673244	0.0563602	0.0004441
Rye	0.0000399	0.2660109	0.0673244	0.0563602	0.0004164
Safflower	0.0000266	0.2660109	0.0673244	0.0563602	0.0002776
Sorghum	0.0000021	0.2660109	0.0673244	0.0563602	0.0000222
Soybeans	0.0000266	0.2660109	0.0673244	0.0563602	0.0002776
soybeans, edible	0.0000266	0.2660109	0.0673244	0.0563602	0.0002776
Sugar beets	0.0000021	0.2660109	0.0673244	0.0563602	0.0000222
Triticale	0.0000239	0.2660109	0.0673244	0.0563602	0.0002498
Wheat	0.0000359	0.2660109	0.0673244	0.0563602	0.0003747

Crop	Risk Quotients†					
	Avian (20 g)			Mammalian (15 g)		
	Acute (# 1)	Acute (# 2)	Chronic	Acute (# 1)	Acute (# 2)	Chronic
Barley	0.000189	0.000039	#DIV/0!	0.000006	0.000002	0.000532
beans	0.000189	0.000062	#DIV/0!	0.000006	0.000003	0.000532
dried beans	0.000189	0.000062	#DIV/0!	0.000006	0.000003	0.000532
lima beans (succulent)	0.000189	0.000039	#DIV/0!	0.000006	0.000002	0.000532
snap beans	0.000189	0.000039	#DIV/0!	0.000006	0.000002	0.000532
Canola	0.000189	0.000003	#DIV/0!	0.000006	0.000000	0.000532
Corn	0.000189	0.000010	#DIV/0!	0.000006	0.000000	0.000532
Cotton	0.000189	0.000007	#DIV/0!	0.000006	0.000000	0.000532
Oats	0.000189	0.000050	#DIV/0!	0.000006	0.000003	0.000532
Onion	0.000189	0.000006	#DIV/0!	0.000006	0.000000	0.000532
cowpeas/ blackeyed peas	0.000189	0.000019	#DIV/0!	0.000006	0.000001	0.000532
Pea	0.000189	0.000070	#DIV/0!	0.000006	0.000004	0.000532
lupine	0.000189	0.000066	#DIV/0!	0.000006	0.000003	0.000532
grain lupine	0.000189	0.000066	#DIV/0!	0.000006	0.000003	0.000532
field peas	0.000189	0.000088	#DIV/0!	0.000006	0.000004	0.000532
Peanuts	0.000189	0.000053	#DIV/0!	0.000006	0.000003	0.000532
Rice	0.000189	0.000062	#DIV/0!	0.000006	0.000003	0.000532
Rye	0.000189	0.000058	#DIV/0!	0.000006	0.000003	0.000532
Safflower	0.000189	0.000039	#DIV/0!	0.000006	0.000002	0.000532
Sorghum	0.000189	0.000003	#DIV/0!	0.000006	0.000000	0.000532
Soybeans	0.000189	0.000039	#DIV/0!	0.000006	0.000002	0.000532
soybeans, edible	0.000189	0.000039	#DIV/0!	0.000006	0.000002	0.000532
Sugar beets	0.000189	0.000003	#DIV/0!	0.000006	0.000000	0.000532
Triticale	0.000189	0.000035	#DIV/0!	0.000006	0.000002	0.000532
Wheat	0.000189	0.000053	#DIV/0!	0.000006	0.000003	0.000532

†

Acute RQ #1 = (mg ai /kg-bw/day) / LD50
 Acute RQ #2 = mg ai ft-2 / (LD50*bw)
 Chronic RQ = mg kg-1 seed / NOEC